ConnectX®-3 Pro 10Gb/s Ethernet Quad Port Network Interface Card User Manual

P/N:

MCX349A-XCCN

Rev 1.0

www.mellanox.com

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1 Introduction

This is the User Guide for Mellanox Technologies Ethernet network interface cards based on the ConnectX®-3 Pro EN integrated circuit device. These card's connectivity provide the highest performing and most flexible interconnect solution for PCI Express Gen3 servers used in Enterprise Data Centers, High-Performance Computing, and Embedded environments.

This chapter covers the following topics:

- Section 1.1, "Product Overview," on page 8.
- Section 1.2, "Features and Benefits," on page 9.
- Section 1.3, "Operating Systems/Distributions," on page 9.
- Section 1.4, "Connectivity," on page 9.

1.1 Product Overview

The following tables provide the ordering part number, port speed, number of ports, and PCI Express speed.

Table 1 - Quad-port 10 Gigabit Ethernet Network Interface Cards

Ordering Part Number (OPN)	MCX349A-XCCN
Data Transmission Rate	[a]100 Mbps, 1 GigE and 10 GigE.
Number of ports	MCX349A-XCCN - 4 BaseT ports
PCI Express SERDES Speed	PCIe 3.0 x8 8GT/s
RoHS	R6
IC-Phy	AQ2402-B0-EG-Y
Adapter IC Part Number	2x MT27528A0-FCCR-FV

a. Will be supported in future release.

1.2 Features and Benefits

Table 2 - Features

PCI Express (PCIe)	Uses PCIe Gen 3.0 (1.1 and 2.0 compatible) through an x8 connector up to 8GT/s
10 Gigabit Ethernet	Mellanox cards comply with the following IEEE 802.3* standards: IEEE Std 802.3-2008 Ethernet. IEEE Std 802.3ae 10 Gigabit Ethernet. IEEE Std 802.3ad Link Aggregation and Failover.
Memory	PCI Express - stores and accesses Ethernet fabric connection information and packet data. 3x SPI Flash - includes three 32Mb SPI Flash devices (1x M25P40-VMN6TPBA device by Micron 2x W25Q32FVSSIG device by WINBOND-NUVOTON). EEPROM - 3x 32Kb FRU EEPROM.

1.3 Operating Systems/Distributions

- Ubuntu, RHEL, other Linux distributions.
- OpenFabrics Enterprise Distribution (OFED).

1.4 Connectivity

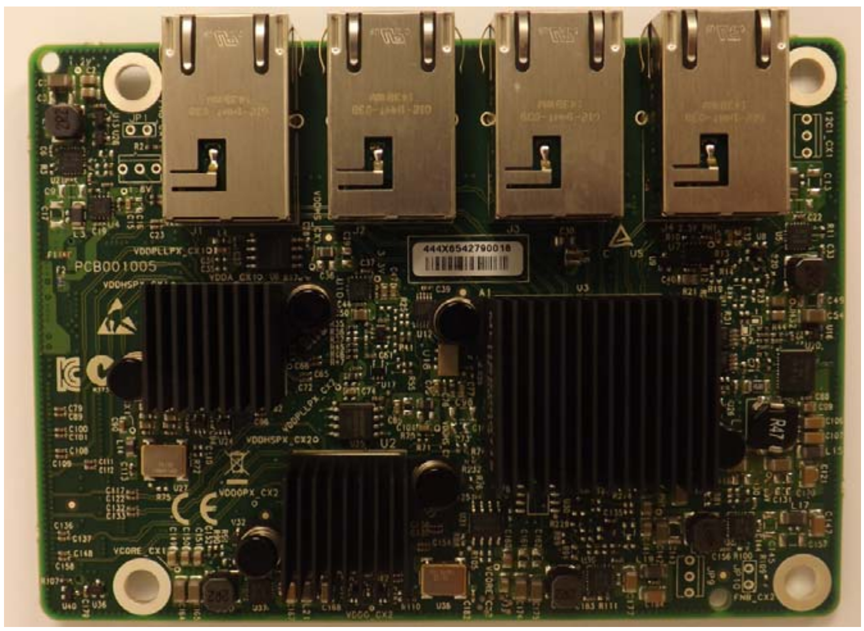
- Any Cat6/6a standard cable up to 90m long.

2 Interfaces

Each network interface card includes the following interfaces:

- “Ethernet Interface”.
- “PCI Express Interface”.
- “I2C-compatible Interface”.
- “LED Interface”.

Figure 1: MCX349A-XCCT Card Photo



2.1 Ethernet Interface

The network ports of the ConnectX®-3 Pro network interface cards are compliant with the IEEE 802.3 Ethernet standards listed in Table 2, “Features,” on page 9.

2.2 PCI Express Interface

The ConnectX®-3 Pro network interface cards support PCI Express 3.0 (1.1 and 2.0 compatible) through an x8 connector. The device can be either a master initiating the PCI Express bus operations or a slave responding to PCI bus operations. The following lists the PCIe interface features:

- PCIe Base 3.0 compliant, 1.1 and 2.0 compatible.
- 2.5, 5.0, or 8.0GT/s link rate x4 per device.
- Auto-negotiates to x4, x2, or x1.

- Support for MSI/MSI-X mechanisms

2.3 I^{2}C-compatible Interface

The board include 2 three-pin header per chip on the network interface cards provided as the I2C-compatible interface.

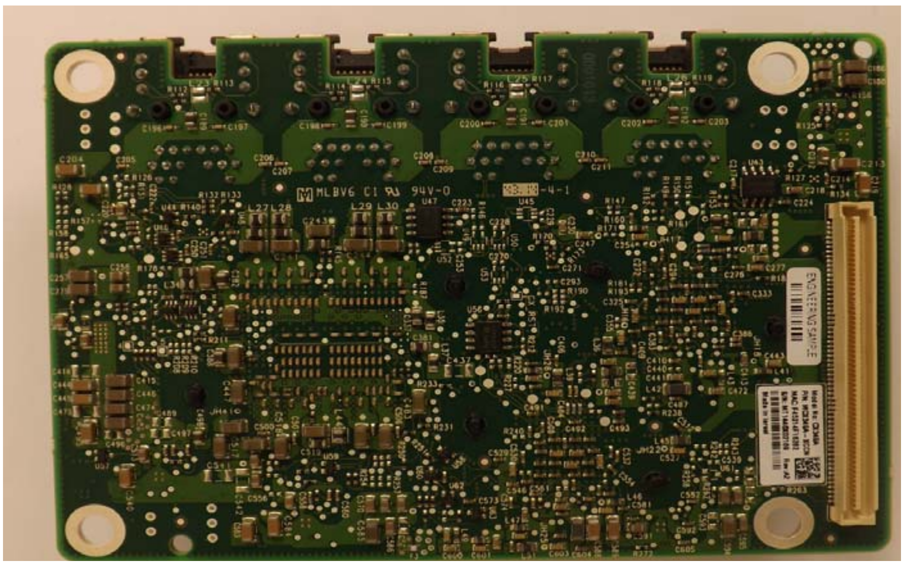
3 Hardware Installation

3.1 System Requirements

3.1.1 Hardware

This card requires a proprietary PCI Express connector. See Figure 2.

Figure 2: PCI Express Connector



3.1.2 Operating Systems/Distributions

Please refer to Section 1.3, “Operating Systems/Distributions,” on page 9.

3.1.3 Software Stacks

Mellanox OpenFabric software package (MLNX_OFED), see Chapter 4, “Driver Installation”.

3.2 Safety Precautions

The card is being installed in a system that operates with voltages that can be lethal. Before opening the case of the system, observe the following precautions to avoid injury and prevent damage to system components.

1. Remove any metallic objects from your hands and wrists.
2. Make sure to use only insulated tools.
3. Verify that the system is powered off and is unplugged.
4. It is strongly recommended to use an ESD strap or other antistatic devices.

3.3 Pre-installation Checklist

1. Verify that your system meets the hardware and software requirements stated above.
2. Shut down your system if active.
3. After shutting down the system, turn off power and unplug the cord.
4. Remove the card from its package. Please note that the card must be placed on an antistatic surface.
5. Check the card for visible signs of damage. Do not attempt to install the card if damaged.

3.4 Card Installation Instructions

To be updated in future release.

3.5 Identify the Card in Your System

3.5.1 On Linux

Get the device location on the PCI bus by running lspci and locating lines with the string "Mellanox Technologies":

```
 > lspci |grep -i Mellanox
 04:00.0 Ethernet controller: Mellanox Technologies MT27520 Fam-
ily [ConnectX-3 Pro]
 82:00.0 Ethernet controller: Mellanox Technologies MT27520 Fam-
ily [ConnectX-3 Pro]
```

4 Driver Installation

4.1 Linux Driver

For Linux, download and install the latest MLNX_EN driver software package available via the Mellanox web site at: http://www.mellanox.com => Products => Software => Ethernet Drivers => ConnectX®-3 EN 10/40GigE Linux Driver => Download. Follow the installation instructions included in the download package (also available from the download page).

4.1.1 Hardware and Software Requirements

Table 3 - Software and Hardware Requirements

Requirements	Description
Platforms	CPU architectures: • power-pc
Device ID	For the latest list of device IDs, please visit http://pci-ids.ucw.cz/read/PC/15b3.
Operating System	Linux Operating Systems: • RedHat EL5.8 • RedHat EL5.9 • RedHat EL6.2 • RedHat EL6.3 • OEL6.2 + 2.6.32-279.19.1 • OEL6.3 + 2.6.32-279.19.1 • SLES11 SP1 • SLES11 SP2 • Ubuntu
Software Dependencies	To install the driver software, kernel sources must be installed on the machine. MLNX_EN driver cannot coexist with OFED software on the same machine. Hence when installing MLNX_EN all OFED packages should be removed (done by the mlnx_en install script)

4.1.2 Installing the Driver

Step a.Download Driver Package

Please download the current driver package from http://www.mellanox.com => Products => Software => Ethernet Driver => Linux Driver => Download.

Step b.Install Driver

Run the following commands to install the driver:

```
#> tar xzvf mlnx_en-1.5.10.tgz file
#> cd mlnx_en-1.5.10
#> ./install.sh
```

The package consists of several source RPMs. The install script rebuilds the source RPMs and then installs the created binary RPMs. The created kernel module binaries are placed under /lib/modules/<kernel-ver>/updates/kernel/drivers/net/mlx4. mlnx_en installer supports 2 modes of installation.The install scripts selects the mode of driver installation depending of the running OS/kernel version.

1. Kernel Module Packaging (KMP) mode, where the source rpm is rebuilt for each installed flavor of the kernel. This mode is used for RedHat and SUSE distributions.
2. Non KMP installation mode, where the sources are rebuilt with the running kernel. This mode is used for vanilla kernels.

Note: If the Vanilla kernel is installed as rpm, please use the "--disable-kmp" flag when installing the driver.

The kernel module sources are placed under /usr/src/mellanox-mlnx-en-1.5.10/.Run the following commands to recompile the driver:

```
#> cd /usr/src/mellanox-mlnx-en-1.5.10/
#> scripts/mlnx_en_patch.sh
#> make
#> make install
```

The uninstall and performance tuning scripts are installed.

If the driver was installed without kmp support, the sources would be located under /usr

5 Burning Card Firmware

Install the MFT package. The package is available at http://www.mellanox.com => Products => Software => Firmware Tools. Make sure to download the package corresponding to your computer's operating system.

```
 # mlxburn -d /dev/mst/mt4103_pciconf1 -img_dir <dir> -force
 -I- Using auto detected image file : <dir>/fw-ConnectX3Pro-rel-
2_33_5100-MCX349A-XCC_0_Ax.bin

     Current FW version on flash:  2.33.5100
     New FW version:               2.33.5100

     Note: The new FW version is not newer than the current FW
version on flash.

 Do you want to continue ? (y/n) [n] : y

 Burning FS2 FW image without signatures - OK
 Restoring signature                     - OK
 -I- Image burn completed successfully.
```

```
 # mlxburn -d /dev/mst/mt4103_pciconf0 -img_dir <dir> -force
 -I- Using auto detected image file : <dir>/fw-ConnectX3Pro-rel-
2_33_5100-MCX349A-XCC_1_Ax.bin

     Current FW version on flash:  2.33.5100
     New FW version:               2.33.5100

     Note: The new FW version is not newer than the current FW
version on flash.

 Do you want to continue ? (y/n) [n] : y

 Burning FS2 FW image without signatures - OK
 Restoring signature                     - OK
 -I- Image burn completed successfully.
 [root@qa-ibm240 ~]#
 [root@qa-ibm240 ~]# mst status
 MST modules:
 ------------
     MST PCI module loaded
     MST PCI configuration module loaded

 MST devices:
 ------------
 /dev/mst/mt4103_pciconf0         - PCI configuration cycles
access.
                                 domain:bus:dev.fn=0000:01:00.0
addr.reg=88 data.reg=92
                                    Chip revision is: 00
 /dev/mst/mt4103_pciconf1         - PCI configuration cycles
access.
                                 domain:bus:dev.fn=0000:03:00.0
addr.reg=88 data.reg=92
                                    Chip revision is: 00
 /dev/mst/mt4103_pci_cr0          - PCI direct access.
                                 domain:bus:dev.fn=0000:01:00.0
bar=0x91e00000 size=0x100000
                                    Chip revision is: 00
 /dev/mst/mt4103_pci_cr1          - PCI direct access.
                                 domain:bus:dev.fn=0000:03:00.0
bar=0x91d00000 size=0x100000
                                    Chip revision is: 00
 [root@qa-ibm240 ~]#
```

6 Troubleshooting

6.1 General

Server unable to find the adapter	• Ensure that the adapter is placed correctly. • Make sure the adapter slot and the adapter are compatible. • Install the adapter in a different PCI Express slot. • Use the drivers that came with the adapter or download the latest. • Make sure your motherboard has the latest BIOS. • Try to reboot the server.
The adapter no longer works	• Reseat the adapter in its slot or a different slot, if necessary. • Try using another cable. • Reinstall the drivers for the network driver files may be damaged or deleted. • Reboot the server.
Adapters stopped working after installing another adapter	• Try removing and re-installing all adapters. • Check that cables are connected properly. • Make sure your motherboard has the latest BIOS.
Link indicator light is off	• Ensure that adapter driver/s is loaded. • Try another port on the switch. • Make sure the cable is securely attached. • Check your are using the proper cables that do not exceed the recommended lengths. • Verify that your switch and adapter port are compatible.
Link light is on, but with no communication established	• Check that the latest driver is loaded. • Check that both the adapter and its link are set to the same speed and duplex settings.

6.2 Linux

Environment Information	cat/etc/issue uname –a cat/proc/cupinfo | grep 'model name' | uniq ofed_info | head -1 ifconfig –a ethtool <interface> ethtool –i <interface_of_Mellanox_port_num> ibdev2netdev
Card Detection	lspci | grep –i Mellanox
Mellanox Firmware Tool (MFT)	Download and install MFT: http://www.mellanox.com/content/pages.php?pg=management_tools&menu_section=34 Refer to the User Manual for installation instructions. Once installed, run: mst start mst status flint –d <mst_device> q
Ports Information	ibstat lbv_devinfo
Firmware Version Upgrade	To download the latest firmware version refer to http://www.mellanox.com/supportdownloader
Collect Log File	/var/log/messages dmesg > system.log**F**

7 Specifications

7.1 MCX349A-XCCN Specifications

Table 4 - MCX349A-XCCN Specifications Table

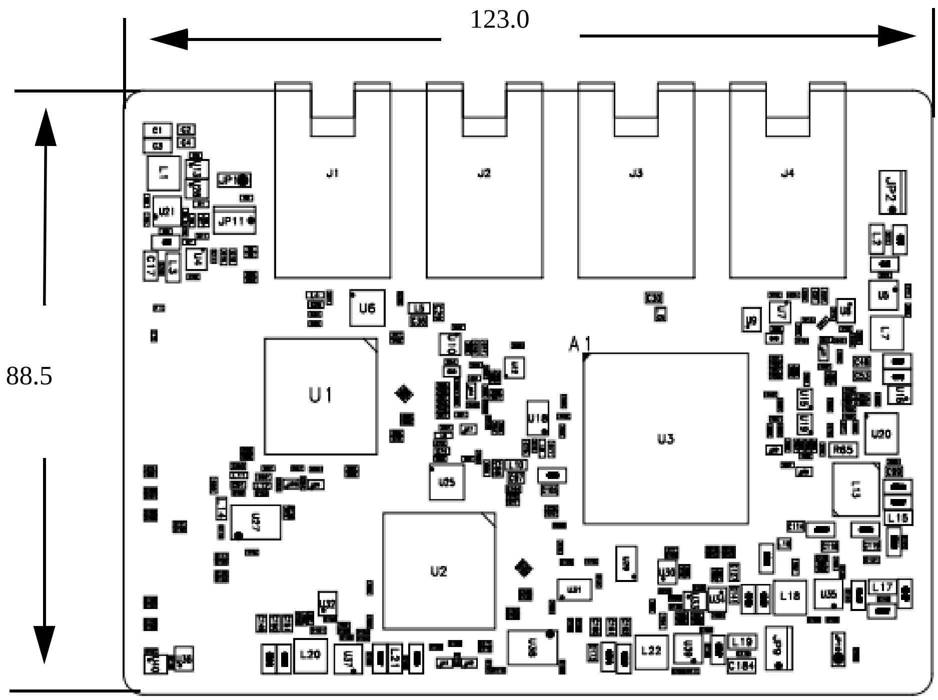
Physical	**Size:** 2.68in. x 4.3 in. (88.5mm x 123mm).
	Connector: RJ45 connector.
Protocol Support	**Ethernet:** 10GBASE-T.
	Data Rate: 100M[a], 1/10Gb/s – Ethernet.
	PCI Express Gen3: SERDES @ 8.0GT/s, 8lanes (2.0 and 1.1 compatible).
Power and Environmental	**Voltage:** 12V,3.3V,5V
	Typ Power: Passive Cables 31W
	Max Power: Passive Cables 35.46W
	Temperature: Operational: 0°C to 56°C Non-operational: 0°C to 70°C
	Humidity: 90% relative humidity[b]
	Air Flow: 10cFM[c]
Regulatory	**EMC:** Refer to the following link: www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf
	Safety: IEC/EN 60950-1:2006 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
	RoHS: RoHS-R6
Cable Support	Any Cat6/6a standard cable up to 90m long.

a. Will be supported in future release.
b. For both operational and non-operational states.
c. Air flow is measured ~1” from the Mezz from the cooling air inlet side.

7.2 Board Mechanical Drawing and Dimensions

All dimensions are in millimeters.
All the mechanical tolerances are +/- 0.1mm

Figure 3: Mechanical Drawing of the MCX349A-XCCN Mezzanine Card



7.3 Adapter LED Operation

There are two I/O LEDs per port. See Table 5 for different LED functions.

Table 5 - Physical and Logical Link Indication

		LED2 (Speed)	LED1
No link	Link	OFF	OFF
	Active		
Linked at 100MHZ	Link	OFF	Solid Green
	Active		Blinking Green
Linked at 1 GHZ	Link	Solid Yellow	Solid Green
	Active		Blinking Green
Linked at 1 GHZ	Link	Solid Green	Solid Green
	Active		Blinking Green

The short bracket has the same port and LED footprints as the tall bracket.

Revision History

This document was printed on June 25, 2015.

Table 6 - Revision History Table

Date	Rev	Comments/Changes
March 2015	1.0	First Release

Appendix A: Finding the MAC and Serial Number on the Card

Each Mellanox card has a label on the print side that shows the card serial number and the card MAC for Ethernet protocol.

Note: The revision indicated on the labels in the following figures do not necessarily represent the latest revision of the card. Card revision changes are communicated via Product Change Notification (PCN) documents that are available via card suppliers.

Figure 4: MCX349A-XCCN Board Label (Example only - see Note)

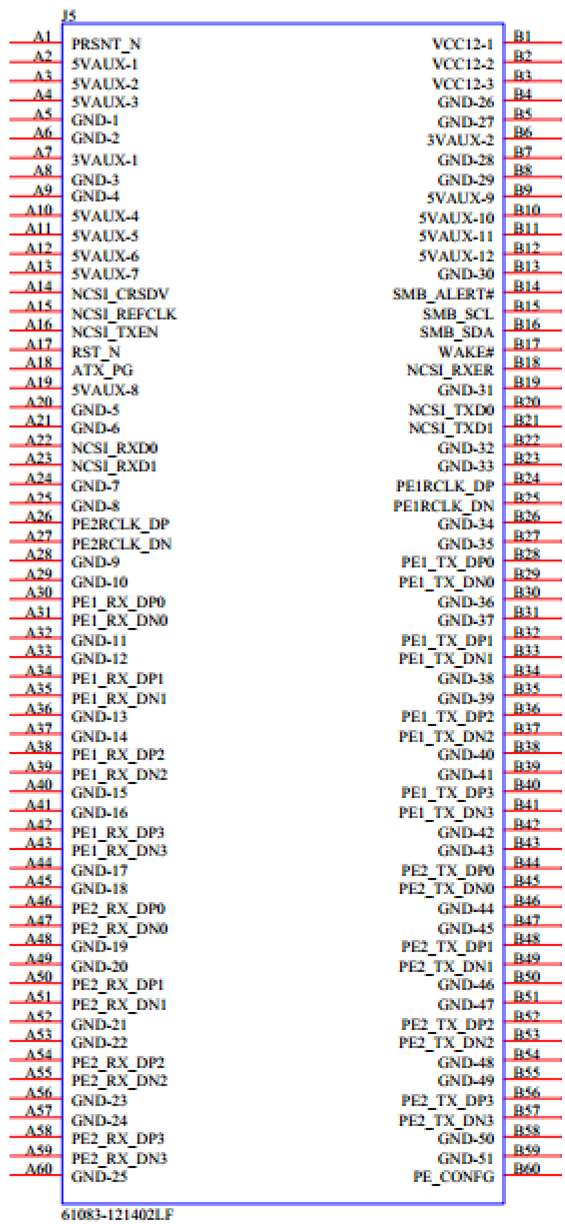


Appendix B: Interface Connectors Pinout

B.1 PCI Express x8 Connector Pinout

The cards use a proprietary PCI Express x8 connector with 2 x4 buses feeding both Mellanox devices. See pinout in Figure 5.

Figure 5: PCIe Connector Pinout



B.2 I²C-compatible Connector Pinout

Two three hole footprints for I2C Harness is provided as the I2C-compatible interface.

Figure 6: Compatible Connector Plug and Pinout

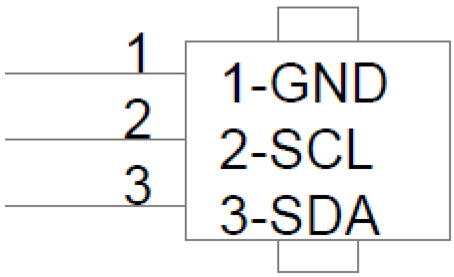


Table 7 - I2C-compatible Connector Pinout

Connector Pin Number	Signal Name
1	GND
2	SCL
3	SDA

Appendix C: Safety Warnings

For safety warnings in French see “Avertissements de sécurité d’installation (Warnings in French)” on page 29. For safety warnings in German see “Sicherheitshinweise (Warnings in German)” on page 31. For safety warnings in Spanish see “Advertencias de seguridad para la instalación (Warnings in Spanish)” on page 33.

1. Installation Instructions

Read all installation instructions before connecting the equipment to the power source.

2. Over-temperature

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F).
To guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. During Lightning - Electrical Hazard

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

4. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

5. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

6. Hazardous Radiation Exposure

Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

CLASS 1 LASER PRODUCT and reference to the most recent laser standards: IEC 60 825-1:1993 + A1:1997 + A2:2001 and EN 60825-1:1994+A1:1996+ A2:2001

Appendix D: Avertissements de sécurité d'installation (Warnings in French)

1. **Instructions d'installation**

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. **Température excessive**

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 55°C (131°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. **Orages – dangers électriques**

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

4. **Installation du matériel**

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

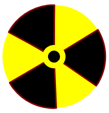
5. **Elimination du matériel**

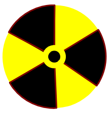
L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

6. **Codes électriques locaux et nationaux**

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

7. Exposition au rayonnement grave





Mise en garde – l'utilisation de commandes ou de réglages ou l'exécution de procédures autres que ce qui est spécifié dans les présentes peut engendrer une exposition au rayonnement grave.

PRODUIT LASER DE CLASSE 1 » et références aux normes laser les plus récentes CEI 60 825-1:1993 + A1:1997 + A2:2001 et NE 60825-1:1994+A1:1996+ A2:2001

Appendix E: Sicherheitshinweise (Warnings in German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 55°C (131°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

4. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

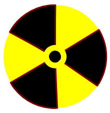
5. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

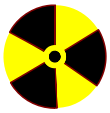
6. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

7. Strahlenkontak



Achtung – Nutzung von Steuerungen oder Einstellungen oder Ausführung von Prozeduren, die hier nicht spezifiziert sind, kann zu gefährlichem Strahlenkontakt führen..



Klasse 1 Laserprodukt und Referenzen zu den aktuellsten Lasterstandards : ICE 60 825-1:1993 + A1:1997 + A2:2001 und EN 60825-1:1994+A1:1996+ A2:2001

Appendix F: Advertencias de seguridad para la instalación (Warnings in Spanish)

1. **Instrucciones de instalación**

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. **Sobrecalentamiento**

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 55°C(131°F). Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

3. **Cuando hay rayos: peligro de descarga eléctrica**

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

4. **Instalación de equipos**

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

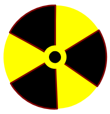
5. **Eliminación de equipos**

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

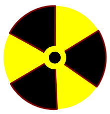
6. **Códigos eléctricos locales y nacionales**

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.

7. Exposición a niveles de radiación peligrosos



Precaución: el uso de controles o ajustes o la realización de procedimientos distintos de los que aquí se especifican podrían causar exposición a niveles de radiación peligrosos.



PRODUCTO LÁSER DE CLASE 1 y referencia a las normas de láser más recientes: IEC 60825-1:2007/03 y EN 60825-1:2007